IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Inventor: | Jacob et al. | | |
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Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

October 10, 2008

## APPEAL BRIEF

Dear Sir:

Attached herewith is an Appeal Brief pursuant to 35 U.S.C. §134 and 37 C.F.R. §41.37 for the above-identified patent application in support of a Notice of Appeal filed with the United States Patent and Trademark Office on August 18, 2008.

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## I. REAL PARTY IN INTEREST

The real party in interest in the above-entitled application is Koninklijke Philips Electronics N.V., Eindhoven, NL.

## II. RELATED APPEALS AND INTERFERENCES

The undersigned attorney/agent, the appellant, and the assignee are not aware of any related appeals or interferences that would directly affect, or be directly affected by, or have a bearing on the Board's decision in this pending appeal.

## III. STATUS OF THE CLAIMS

Claims 1-15 are pending and are all on appeal. Claims 1-15 stand rejected. Claims 1-3, 5-13 were amended and claims 14-15 were added during prosecution.

## IV. STATUS OF AMENDMENTS

No after final amendments have been submitted.

## V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Claim 1

Claim 1 is directed towards an image processing system 150 for displaying information relating to the amplitude of displacements (page 4, line 31) of wall regions of a deformable 3D object under study (page 4, line 16; page 5, lines 5-6), with the system comprising: acquisition means (page 9, lines 34-35) for acquiring image data of an image sequence (page 9, line 35) of the 3D object under study; processing means 120 (see also page 5, line 19) for processing the 3D object data in the images of the sequence by locating the 3D object wall (page 5, line 26-27), defining regions of interest on the 3D object wall (page 7, lines 27-29), and processing the image data of the 3D object wall to determine the amplitude of displacement (page 6, line 16 to page 7, line 21) of each of the regions of interest as a function of time, constructing a first 2D simplified representation 20 A of the 3D object wall

(page 8, line 6-8) by projection of the 3D object wall along an axis, comprising the projections of the regions of interest as a function of time (Figure 3; page 7, line 32 to page 8, line 8); and display means (page 8, lines 12-14) for displaying indications of the amplitudes of displacement of each of the regions of interest of the 3D object wall in the respective projections of the regions of interest (page 8, lines 16-19), called segments, in the constructed 2D simplified representation 20.A.

Claim 2

Claim 2 depends from claim 1, and requires that the means for constructing the first 2D simplified representation (page 5, lines 9-11), called 2D simplified amplitude representation 20.A (page 8, lines 32-35), provide indications of amplitudes that are indications of the maximal and minimal amplitudes of displacements of the regions of interest over a period of time.

Claim 3

Claim 3 depends from claim 2, and requires that the image processing system 150 of claim 2 further comprises means for constructing a second 2D simplified representation of the 3D object wall (page 5, lines 9-11), similar to the first 2D simplified representation of the 3D object wall, and with similar projections of the regions of interest, called segments, this second 2D simplified representation being called 2D simplified phase representation 20.B; and displaying indications of the instants of time at which the maximum or minimum of amplitudes of displacements occur in the regions of interest, over said period of time, in the 2D simplified phase representations (page 8, line 36 to page 9, line 2).

Claim 4

Claim 4 depends from claim 3, and requires that the image processing system 150 of claim 3 comprise means for displaying the 2D simplified amplitude representation 20.A and the 2D simplified phase representation 20.B together in a same image (page 9, lines 4-8).

Claim 5

Claim 5 depends from claim 4, and requires that the image processing system 150 of claim 4 comprise means to display the values of amplitude and of time in the respective 2D simplified amplitude representation 20.A and the 2D simplified phase representation 20.B indicated in a color-coded manner (page 8, lines 33-34; page 9, line 1).

Claim 11

Independent claim 11 is directed towards an image processing method for processing ultrasound image data and for displaying an ultrasound image of a deformable 3-D organ (page 4, line 16; page 5, lines 5-6) with indications of the organ wall motions, comprising steps of acquiring image data of an image sequence for locating the 3D object wall (page 9 line 35), defining regions of interest on the segmented 3D organ wall (page 7, lines 27-29), and processing the image data to determine the amplitude of displacement of each of the regions of interest as a function of time (page 5, lines 26-27); constructing a first 2D simplified representation of the 3D segmented organ wall 20.A by projection of the 3D simplified representation (page 7, line 32 to page 8, line 8); and displaying indications of the amplitudes of displacement of the regions of interest of the 3D segmented organ wall in the respective projections of the regions of interest, called segments, in the constructed 2D simplified representation, in a color coded manner (page 8, lines 16-19; page 8, lines 33-34; page 9, line 1).

Claim 12

Claim 12 depends from claim 11 and requires the method of claim 11 to comprise the steps of displaying indications of the maximal and minimal amplitudes of displacement of each of the regions of interest, over a period of time, this first 2D simplified representation being called 2D simplified amplitude representation 20.A (page 8, lines 32-35); constructing a second 2D simplified representation of the 3D segmented organ wall, similar to the first 2D

simplified representation of the 3D segmented organ wall, and with similar projections of the regions of interest, called segments, this second 2D simplified representation being called 2D simplified phase representation 20.B (page 8, line 36 to page 9, line 2); displaying indications of the instants of time at which the maximum or minimum of amplitudes of displacements occur in the regions of interest, over a period of time, in the 2D simplified phase representation (page 9, lines 1-8); and displaying the 2D simplified amplitude representation and the 2D simplified phase representation in a same image at the same time (page 9, lines 4-8).

Claim 13

Claim 13 depends from claim 11 and requires a computer program product (page 10, line 6) comprising a computer readable medium including a set of instructions for carrying out a method as claimed in one of claims 11 or 12 (page 10, lines 6-8).

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-15 are unpatentable under 35 U.S.C. §103 over Maurincomme et al. (US 6,879,711) in view of Metaxas (US 6,295,464) and further in view of Ryals et al (US 5,803,914)

## VII. ARGUMENTS

A. Rejection of Claims 1-15 Under 35 U.S.C. §103

Claims 1-15 are rejected as being unpatentable under 35 U.S.C. §103(a) over Maurincomme et al., in view of Metaxas and further in view of Ryals et al. This rejection should be reversed because the combination of Maurincomme et al., Mextaxas, and Ryals et al. does not teach or suggest all the limitations of the subject claims and, therefore, fails to establish a *prima facie* case of obvious with respect to the subject claims.

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art *In re Royka*, 490 F.2d 981, (CCPA 1974). "MPEP §2143.03.

***Maurincomme et al.***

Maurincomme et al. is directed towards a method for reconstructing blood cells through comparing a three-dimensional angiography image obtained by a radiology apparatus and a three-dimensional image obtained by a nuclear magnetic resonance apparatus, the comparison starting from a point where both images correspond (i.e., the image is the same at the given point). Thereafter, a rotation is estimated, where the rotation is defined by three angles of rotation on three axes whose origin is the corresponding point chosen previously. Next, an estimate is made of a translation, with the translation being defined by three coordinates on each of the three axes, again the origin being the corresponding point. Application of this registration in translation to one of the two images produces two mutually registered images, presenting an improved correspondence between the blood vessels relative to the adjoining tissues.

***Metaxas***

Metaxas is directed towards a method and apparatus for dynamically modeling an object, involving receiving signals from a sensor which corresponds to points within the object. A volumetric model is provided which represents the object and any motion changes within the object. These motion changes are determined by an estimation method.

***Claim 1***

Independent **claim 1** recites, among other things, processing the image data of a 3D object wall to determine the amplitude of displacement of a plurality of regions of interest as a function of time. The combination of Maurincomme et al. and Metaxas fails to teach or suggest this element.

The Final Office Action concedes that Maurincomme et al. does not disclose this feature but states that Metaxas discloses this feature at column 12, lines 45-63 and Figures 9a-c. The Final Office Action also states that it would have been obvious to modify Maurincomme et al. to include such a feature "in order to track the motion of the object/region of interest for characterization of heart wall motion on a regional level to understand cardiac mechanics and the processes underlying a disease." Applicants respectfully disagree. At the onset, the cited text in Metaxas does not disclose processing any image data of a 3D object wall. Indeed, the cited text makes no mention of any object wall. Furthermore, the cited text does not disclose determining the amplitude of displacement of a plurality of regions of interest as a function of time. The text merely discloses that a length of a left ventricle may change from 8cm to 10cm from a first time to a second time. Furthermore, Figures 9a-9c do not even show any image data of a 3D object wall, or any image data at all. They are plots produced from a model of left ventricular behavior. Therefore, no combination of the cited references could produce the system of claim 1.

Furthermore, Applicants respectfully submit that the supposed reason for modifying Maurincomme et al. to determine the amplitude of displacement of a plurality of regions of interest as a function of time does not make any sense. The entire purpose of Maurincomme is to precisely register a 3D X-ray image with a 3D nuclear magnetic resonance (NMR) image of a same object (e.g., a human heart) so that the overlaid images can be displayed to a user (e.g., a physician) for better visualization. Meanwhile, as noted above, Metaxas is directed to developing a model of the left ventricle of the heart—and it is Metaxas' model that supposedly would provide characterization of heart wall motion on a regional level to understand cardiac mechanics and the processes underlying a disease." So in order to modify Maurincomme et al. to provide this benefit, one would have to replace Maurincomme's overlaid X-ray and NMR images with Metaxas' model. This, of course, would destroy the entire point of Maurincomme et al.'s invention. Even if this made any sense, such a modification would be improper (see MPEP §§ 2141.03(V) -2141.03(VI)). Accordingly, for

at least these reasons, Applicants respectfully submit that claim 1 is patentable over the cited art.

***Claims 2-6***

Claims 2-6 all depend from claim 1 and are deemed patentable for at least the reasons set forth above with respect to claim 1, and for the following additional reasons.

**Claim 2**, among other things, provides indications of the maximal or minimal amplitudes of displacements of the regions of interest over a period of time. The Final Office Action states that Metaxas discloses this feature at column 12, lines 45-63. Applicants respectfully disagree. The cited text does not make any mention of any maximal or minimal amplitudes of displacements. The cited text does not mention any plurality of regions of interest. Accordingly, for at least these additional reasons, Applicants respectfully submit that claim 2 is patentable over the cited art.

**Claims 3 and 4** recite, among other things, display indications of the instants of time at which the maximum or minimum of amplitudes of displacements occur in the regions of interest, over the period of time, in the 2D simplified phase representation and means for displaying the 2D simplified amplitude representation and the 2D simplified phase representation together in a same image. The Final Office Action states it would have been obvious to modify the Maurincomme et al., Metaxas, and Ryals et al. combination to utilize these features. Applicants respectfully submit that since the combined references do not disclose or suggest a system including this feature, the rejection of claim 3 is improper. Also, contrary to the Final Office Action, Figure 13 of Ryals et al. does not show a display of the 2D simplified amplitude representation and the 2D simplified phase representation together in a same image, and column 38, lines 27-48 certainly does not disclose any such display. Rather, Figure 13 shows a representation of the "quantify screen" generated by the computer system of the quantified data sets. Accordingly, for at least these additional reasons, Applicants respectfully submit that claims 3 and 4 are patentable over the cited art.

**Claim 5** recites that the image processing system of claim 4 comprise means to display the values of amplitude and of time in the respective 2D simplified amplitude

representation and the 2D simplified phase representation indicated in a color-coded manner. The Final Office Action states that Ryals at Figure 15 teaches this feature and that it would have been obvious to modify the Maurincomme et al., Metaxas, and Ryals et al. combination to incorporate this feature, "in order for the user to easily observe any significant changes in the displacement of the region of interest." Applicants respectfully submit that, contrary to the Final Office Action, Figure 15 of Ryals et al. does not show a display of the 2D simplified amplitude representation and the 2D simplified phase representation together in a same image, or color-coding. Accordingly, for at least these additional reasons, Applicants respectfully submit that claim 5 is patentable over the prior art.

***Claims 11-13***

**Claim 11**, among other things, recites processing the image data of a 3D object wall to determine the amplitude of displacement of a plurality of regions of interest as a function of time. As explained above with respect to claim 1, no combination of the cited art would produce a method that includes such a feature. Accordingly, for at least these reasons, Applicants respectfully submit that claim 11 is patentable over the cited art.

**Claims 12 and 13** depend from claim 11 and are deemed patentable for at least the reasons set forth above with respect to claim 11. Claim 12 is also deemed patentable for similar reasons to those set forth above with respect to claim 3.

***Other Dependent Claims***

Other dependent claims not specifically mentioned above are believed to be allowable at least by virtue of their dependencies on their respective base claims.

## VIII. CONCLUSION

In view of the foregoing, it is submitted that claims 1-15 distinguish patentably and non-obviously over the prior art of record, and reversal of the rejection of claims 1-15 is respectfully requested.

Respectfully submitted,

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## IX. CLAIM APPENDIX

1. (Previously presented) An image processing system for displaying information relating to the amplitude of displacements of wall regions of a deformable 3D object under study, the system comprising:

acquisition means for acquiring image data of an image sequence of the 3D object under study;

processing means for:

processing the 3D object data in the images of the sequence for locating the 3D object wall, defining regions of interest on the 3D object wall, and processing the image data of the 3D object wall to determine the amplitude of displacement of each of said regions of interest as a function of time; and

constructing a first 2D simplified representation of the 3D object wall by projection of the 3D object wall along an axis, comprising the projections of the regions of interest in said 2D simplified representation; and

display means for displaying indications of the amplitudes of displacement of each of the regions of interest of the 3D object wall in the respective projections of said regions of interest, called segments, in said constructed 2D simplified representation.

2 (Previously presented) The image processing system of claim 1, wherein the means for constructing this first 2D simplified representation, called 2D simplified amplitude representation, provides indications of amplitudes that are indications of the maximal or minimal amplitudes of displacements of the regions of interest over a period of time.

3. (Previously presented) The image processing system of claim 2, further comprising means for:

constructing a second 2D simplified representation of the 3D object wall, similar to the first 2D simplified representation of the 3D object wall, and with similar projections of the regions of interest, called segments, this second 2D simplified representation being called 2D simplified phase representation; and

displaying indications of the instants of time at which the maximum or minimum of amplitudes of displacements occur in the regions of interest, over said period of time, in said 2D simplified phase representation.

4. (Original) The image processing system of claim 3, comprising means to display the 2D simplified amplitude representation and the 2D simplified phase representation together in a same image.

5. (Previously presented) The image processing system of claim 4, comprising means to display the values of amplitude and of time in the respective 2D simplified amplitude representation and the 2D simplified phase representation indicated in a color-coded manner.

6. (Previously presented) The system of claim 1, comprising means to display indications of the amplitudes of displacement of the regions of interest of the 3D object wall in the respective projections of the regions of interest, called segments, in said constructed 2D simplified representation, in a color-coded manner, the indications of the amplitudes of displacement changing in the segments at the rate of the images of the sequence, so as to form an animated 2D simplified representation as a function of time.

7. (Previously presented) The image processing system of one of claims 1 to 6, comprising means to display the 2D simplified representations of the 3-D object wall as 2D bull's eye representations

8. (Previously presented) The image processing system of claim 1, wherein the object under study is the heart left ventricle and the regions of interest include the internal boundary of the left ventricle wall.

9. (Previously presented) The image processing system of claim 1, wherein the processing means for locating the 3D object wall is a segmentation means for operating a segmentation technique applied to the 3D object under study, which includes using a mesh model technique, and reshaping the mesh model for mapping said mesh model onto the wall of the 3D object under study, so as to provide a simplified volume with a wall, called object wall, that is the object of interest.

10. (Previously presented) A system comprising a suitably programmed computer or a special purpose processor having circuit means, which are arranged to process image data as claimed in claim 1, and having means to display the processed images.

11. (Previously presented) An image processing method for processing ultrasound image data and for displaying an ultrasound image of a deformable 3-D organ with indications of the organ wall motions, comprising steps of:

acquiring image data of an image sequence of the organ under study, segmenting the 3-D organ in the images of the sequence for locating the 3D object wall, defining regions of interest on the segmented 3D organ wall, and processing the image data to determine the amplitude of displacement of each of said regions of interest as a function of time;

constructing a first 2D simplified representation of the 3D segmented organ wall by projection of the 3D segmented organ wall along an axis, comprising the projections of the regions of interest in said 2D simplified representation; and

displaying indications of the amplitudes of displacement of the regions of interest of the 3D segmented organ wall in the respective projections of the regions of interest, called segments, in said constructed 2D simplified representation, in a color coded manner.

12. (Previously presented) The method of claim 11, comprising steps of:

displaying indications of the maximal or minimal amplitudes of displacement of each of the regions of interest, over a period of time, this first 2D simplified representation being called 2D simplified amplitude representation;

constructing a second 2D simplified representation of the 3D segmented organ wall, similar to the first 2D simplified representation of the 3D segmented organ wall, and with similar projections of the regions of interest, called segments, this second 2D simplified representation being called 2D simplified phase representation; displaying indications of the instants of time at which the maximum or minimum of amplitudes of displacements occur in the regions of interest, over a period of time, in said 2D simplified phase representation; and

displaying the 2D simplified amplitude representation and the 2D simplified phase representation in a same image at the same time.

13. (Previously presented) A computer program product comprising a computer readable medium including a set of instructions for carrying out a method as claimed in one of claims 11 or 12.

14. (Previously presented) The method of claim 11, wherein displaying indications of the amplitudes of displacement of the regions of interest comprises displaying values of the amplitudes in a color-coded manner.

15. (Previously presented) The method of claim 12, wherein displaying indications of the amplitudes of displacement of the regions of interest, and displaying the indications of the instants of time at which the maximum or minimum of amplitudes of displacements occur in the regions of interest in the respective 2D simplified amplitude representation and the 2D simplified phase representation comprises displaying values of the amplitudes and of the instants in time in a color-coded manner.

## X. <u>EVIDENCE APPENDIX</u>

None.

## XI. RELATED PROCEEDINGS APPENDIX

None known to undersigned attorney/agent.